PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference ASK074BWO	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/EP2004/009407	International filing date *(day/month/year)* 23.08.2004	Priority date *(day/month/year)* 22.08.2003
International Patent Classification (IPC) or national classification and IPC F04D15/00, F04D13/08		
Applicant ASKOLL HOLDING S.R.L. et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 2 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
21.03.2005	23.05.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Giorgini, G Telephone No. +49 89 2399-7244

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/009407

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-11	as originally filed
Claims, Numbers	
1-12	received on 11.04.2005 with letter of 04.04.2005
Drawings, Sheets	
1/5-5/5	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-12
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-12
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Reference is made to the following document:

D1: EP 1 054 506 A

V.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses an electronic driving device for a synchronous pump having a synchronous electric motor with a permanent magnet.
The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as providing a submerged pump driven by a synchronous motor with a control system able to ensuring a quick reaching of the synchronous state after a rapid turn-on phase avoiding excessive stressing of the device components.

The solution to this problem proposed in the characterising portion of claim 1 is considered as involving an inventive step (Article 33(3) PCT) in that the skilled person, starting from the control device of D1 would not be prompted to modify it in the direction specified in claim 1.

Claims 2 to 12 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

V.2 The following objections are nevertheless raised:

- Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor are these documents identified therein.

CLAIMS

1. A electronic driving device (20) for turning on and off a synchronous pump comprising a synchronous electric motor (1) with a permanent-magnet rotor (8), comprising:

- at least a static power switch (17) inserted in series between the motor (1) and an AC electric power supply source (Vp); and

- a processing unit (16) having at least an input receiving a synchronism signal (V) and a control output connected to said switch (17);

- characterised in that it is enabled by a signal emitted by a float level sensor (40) and includes an input receiving a signal (α) by a position sensor (21) detecting the rotor (8) polarity and position;

- the pump turn-on and off being regulated according to the signal emitted by said level sensor (40) and to a measured difference between a critical load angle (δ) and a current load angle computed during different working conditions of the pump.

2. A device according to claim 1, characterised in that said position sensor (21) is a Hall-effect sensor.

3. A device according to claim 1, characterised in that the motor comprises rotor poles (N, S) divided by an ideal plane (9) whose rest position is orthogonal to the position of said position sensor (21).

4. A device according to claim 1, characterised in that said float level sensor (40) comprises a Hall probe (37).

5. A device according to claim 1, characterised in that the float (36) of said level sensor (40) is incorporated in an envelope (31), externally associated with the body (25) of the pump (15) and the sensor element (37) of said level sensor (40) is housed in the pump body (25) in correspondence with said float (36).

6. A device according to claim 5, characterised in that said float (36) is equipped in its lower part with a permanent magnet (29).

7. A device according to claim 1, characterised in that said pump (15) is an immersion pump.

8. A device according to claim 1, characterised in that said electronic device (20) is housed on an electronic board (38) positioned inside the pump body (25) in a position just underlying the float level sensor (40.

9. A device according to claim 1, characterised in that said phase displacement is indirectly measured in said unit (16) by detecting the rotor inductance, by means of said sensor (21), being complementary to the back electromotive force.

10. 10. A device according to claim 1, wherein the pump is immediately turned off if the value of a counter (T2) is greater than e predetermined time limit (Te) defined for an emergency stop.

11. A device according to claim 1, wherein said critical load angle (δ) is a mean value among N sampled values.

12. A device according to claim 1, characterized by a first time counter (T1) that is incremented every time instants wherein the float level sensor is low and the pump is off to check the inactivity time period of the pump and turn it on for a predetermined short time period.